



## My Story in Computing with Dave Zubrow

Featuring Dave Zubrow as Interviewed by Suzanne Miller

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**Suzanne Miller:** Hi, my name is Suzanne Miller. I am a principal researcher here at the Software Engineering Institute, [Software Solutions Division](#). Today I am thrilled to be joined by my friend and colleague, Dr. David Zubrow. He has been the lead of the Software Engineering Measurement and Analysis initiative. He has recently retired from full-time work. I am insanely jealous of him. But he has come back for part-time work with us, thank you Dave. We are going to talk to him as part of our series on, *How did you get into software engineering and cybersecurity*, and help other people understand why they might want to be part of this exciting industry. He has been with CMU [Carnegie Mellon University] for over 30 years. He's been with the SEI for 29 of those years. He had a hand in starting and maturing lots of different things, including the [Capability Maturity Model \[CMM\]](#) and the [measurement and analysis](#) work that is well-known in many circles, especially of the DoD. I want to welcome you Dave, and thank you very much for joining me today.

**Dave Zubrow:** Thanks Suzy! It's great to be here.

**Suzanne:** Let's start off by having you tell us about yourself, and what is it that actually brought you back after retiring? What is the current work that you do, so people get an idea of what would make it exciting to be an SEI person in measurement and analysis of all things.

**Dave:** Well, what brought me back is, I really enjoy the work. We are doing a project right now, applying some [machine-learning techniques for diagnostic purposes](#), of engines and part of the sustainment activity. And it's a terrific challenge. One of the reasons I came back is not because it was easy, it's because it's been so hard. And so there's still more to be done with that.

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And the other reason is just with the transition. I was in my position for a long time. And I'm sure we'll talk about this later, but matured the group. It's been through a lot of phases of activity and development cycles. So, I just wanted to help assist with some of the transition, close out some of the work. So...

**Suzanne:** Because you're a nice guy, and you are not going to leave us hanging. And we appreciate that. All right. Let's go back and help people understand a little bit about your career here at the SEI. What brought you to the...and who brought you to the SEI? Tell us a little bit about some of the different roles that you've had during your tenure with us.

**Dave:** Well, I ended up at the SEI in sort of an interesting way. I had been a graduate student, and my colleague [Jane Siegel](#) ran what was called the Empirical Methods group at the SEI back in 1992. And at that time, [Bill Curtis](#) was the Process Program manager. And Jane knew me, and I was actually in the midst of moving, switching jobs from working in the Carnegie Mellon administration. I was the assistant director of analytic studies there and was going to take a biomedical research position at Pitt [University of Pittsburgh]. And ended up talking with Jane a little bit, and she was like, *Why don't you come over here?* I interviewed, and the rest, as they say, is history. Came to the SEI, and actually not too long, about a year and a half after, Jane went back to campus, and I became the manager of the Empirical Methods group, which then led into the SEMA [Software Engineering Measurement and Analysis] group.

**Suzanne:** So you and I were...came into the SEI around the same time. I came in as a resident affiliate in '92.

**Dave:** From Lockheed.

**Suzanne:** Yes. That was in those days. Back in the day. I want you to tell people about the very special Macintosh that you had in your office at the SEI.

**Dave:** That I turned into a fish tank?

**Suzanne:** That's the one! What made you decide that a Macintosh could become a fish tank?

**Dave:** I just thought it was a nice way to have...it was actually the cover of the Mac, right? I had upgraded my, I guess my original Mac to a Mac SE. They put a new cover on it. I thought, oh, this'll fit right over my little fish tank.

**Suzanne:** I'll never forget the first time I walked in and saw the fish going around inside. So that tells people a little bit about your sense of humor. It also points to the fact that I know you have a longstanding love of the ocean and sea creatures. To give people an idea about, before we get into job things, a little bit about what's your favorite thing to do out in the ocean?



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**Dave:** Well, I scuba dive. I've been doing that for over 20 years, 20-something years. I just find it very peaceful and calming to just be underwater and watching the various creatures. I have had the good fortune to be able to go to quite a few places around the world to indulge that hobby. You meet a lot of wonderful people, and experience a lot of cultures along the way.

**Suzanne:** One of the things I expect to see in your retirement is a gallery showing of your underwater photography. Because I've been one of the people that has been fortunate enough to see the pictures that you've shared, and the photographs you've shared of some of the creatures that you have encountered. And one, there are some of those where I go, *I sure am glad I wasn't that close to that thing*. And two, they are quite beautiful. So you know, you're not just a measurement geek, you are also an artist. And so that's...

**Dave:** Well, thanks.

**Suzanne:** ...to bring out that we aren't just one-dimensional here at the SEI. And, you in particular are one of the people I look at in terms of having a really nice, balanced life.

**Dave:** Well, thanks.

**Suzanne:** I hope I see a gallery showing sometime soon.

**Dave:** Yes. Because I haven't been able to go diving, I take pictures of birds.

**Suzanne:** Yes.

**Dave:** I actually set up my desk for work at home near my bird feeders.

**Suzanne:** There you go. There you go.

**Dave:** I had a few pictures published in the *[Pittsburgh] Post-Gazette*.

**Suzanne:** There you go!

**Dave:** Back in May. So yes.

**Suzanne:** We're going to see more of Dave Zubrow the photographer, I think.

**Dave:** Yes.

**Suzanne:** OK, let's flip back to your work at the SEI. You have done a lot of things that I am very proud of the SEI having done. What is the thing that you're most proud of in terms of your work here at the SEI? What is the thing that you say, *I see an impact that I have made for our sponsors and for the world and for people that are working in this industry?*



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**Dave:** I thought about this question a little bit. Because probably—and I’m not going to directly answer your question right now, as asked—but, I think one of the things that I’m proudest of is actually the SEMA team, and what it has been able to accomplish and how it has kind of flowed with changes in the field. This goes back to the actual name. There used to be Software Process Measurement. And when the Empirical Methods group and the Software Process Measurement groups joined, I insisted that we add the word *analysis*, and call it Software Engineering Measurement and Analysis. Because the measurement side of things is important—it’s fundamental—but you also need the analysis. I like to say we want to make our work kinetic, in terms of driving action. A lot of it has been around process improvement, project management. But if the results of the analysis aren’t acted upon, then it’s sort of for naught. And, so, being able to get the team to do that and continue with that work is one thing that I’m proud of.

A couple of work products, sort of broken up over some years. The [Maturity Profile](#) was sort of my trial by fire in a way, of coming into the SEI. I took that on, and thank goodness I had Bill Curtis’s support, because back in those days, the very early days of CMM, there was a desire, and folks had produced an early version of the Maturity Profile, but it was hard to get the data from people. Even in the SEI, there was a certain ownership of assessment results and not wanting to put them in a central repository. There was a desire to...all this had to be very close hold. So I had to earn the trust of people inside the building, I had to earn the trust especially as a group of the various assessment providers or vendors, people conducting assessments, the companies being assessed. And then turn it into an analytic product that everybody felt was valuable and that they wanted. And so the community Maturity Profile, it lived on for a long time. I mean, long after I was responsible for it, that was one thing. The other one was getting the [DoD Software Factbook](#) done. And this was sort of a funny one, and I don’t know if you have had this experience or not, but we sometimes will publish things, and you get no feedback whatsoever.

**Suzanne:** Yes.

**Dave:** You just don’t know. It’s like, *Was that valuable? Was all that effort and time and care and angst over it worth it?* And then lo and behold, you could be just somewhere at a meeting, or meet somebody, and somehow the conversation goes around and, *Oh yes, we use that all the time.* What a wonderful feeling it is to get that feedback. But there is nobody out there that is directly providing that. When you deliver a course, when you do some training, you’ll get some immediate feedback from people. That is always a very good feeling, or you are working closely with a customer, and you help them actually accomplish something. You get that immediate feedback. Some of the work that we do, it’s sort of open loop. You put it out there, and you don’t necessarily get the feedback back. Those are a couple of thoughts that came to mind.



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**Suzanne:** When I was thinking about our interactions and different things that have affected my work from SEMA, one of them actually is the modification that SEMA made to a model that's used a lot in helping people to set goals and measure against them in software and other areas. It's called the [GQM framework](#); the goal, question, metric framework. And SEMA added in the concept of *indicator*. [Our version of it is GQIM](#). Basically that *indicator* addition forces people to think about the visualization, the analysis, what is it we're going to do with it. I have got to say, that is one of the things in my work that I use probably more than anything that SEMA has produced over the last 30 years, because it's that missing link between capturing the measures and answering the questions. Because if I give you a visualization that is meaningless, then we can't answer the question. We can't know if we met the goal. So, encouraging people to spend time on that layer of how you look at things, I actually think is a really important contribution. It may be like a small thing in your own mind, but I just want you to know that...back to that open loop, I use it all the time, Dave.

**Dave:** Well, good! And you know what? A couple of points about that, because obviously I agree with you. A couple of reasons for that step in there. Often it is the consumable by a decision maker, and going back to, *Let's keep things action-oriented*. My physics analogy: kinetic versus potential energy. You got a bunch of data. You got some measures. There may be some potential in there, but it hasn't been transformed yet. So, getting people to think about what is the indicator, you are automatically getting their buy-in too, in terms of what they'll actually use and what they see as valuable. Because we use it as an elicitation, *Sketch it out. Draw me the X- and Y-axes. What's the data that's going in here? Are we showing it over time?* All this stuff. You get people to draw and then they can do it on a whiteboard, *No, no, no I don't think, I think it should look like this. Go for it.* That's one thing. The other thing is that once you have the picture, then you can start to say, *OK, what is the data we need to collect?*

**Suzanne:** Right.

**Dave:** So, now, all the data has a home. It has a purpose, right? It has a place to be. In organizations, a lot of times the data providers aren't the managers, the consumers of the output. So the people providing the data often like to know, *How is this going to be used?* Now you can tell them.

**Suzanne:** Exactly.

**Dave:** And you can ask them. And when we do the elicitation, we'll ask, go back and ask them—the people whose processes are involved or who are going to be responsible for generating the data, *Here's what we're trying to do, what's the best way for us to collect this?*

**Suzanne:** Yes.



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**Dave:** And get them to participate in the process. It makes it a lot more collaborative, and it knocks down some of the potential suspicions and mistrust about, *How are you going to use that data?* We find GQIM to still be relevant.

**Suzanne:** Absolutely.

**Dave:** I still do encounter people who are using it, even though our current research-and-development activities have gone off into the machine-learning worlds.

**Suzanne:** But I think that it's an example of something that has actually transitioned very well, and it's self-sustainable. Those are things that I think the SEI needs to celebrate, because we don't always celebrate that, *We don't have to pay attention to this anymore, it's become part of the DNA of how we go about certain things.* And that's the one for me that really stood out.

Let's give people a little bit of idea about what got you here, in terms of your early influences growing up, and your college years. What is it that made this such a good fit for you, and the goals that you had early on? Think about when you were like in eighth grade. Maybe not.

**Dave:** OK. We'll try not to go back quite that far, and we'll fast-forward through some of these years. But I was a child or am a child of the '60s, and into music, peace, love, rock and roll. But also was very much into sort of the—it sort of hearkens into today somewhat—a lot of the social activism of that. When I went to college, I actually thought I was going to end up in chemistry. I grew up near Westinghouse Research, and our high school had a chemistry competition funded by Westinghouse.

**Suzanne:** Oh!

**Dave:** So, when I was in tenth grade, I came in I think fourth out of the entire high school. I thought, *OK, seems like something to do. I'll go to college for that.* That lasted one term up at Penn State. Then I did a term of...I thought, *Oh, I'm going to go into theater arts.* So obviously there was no goal.

[ Laughter ]

**Dave:** OK? There was a lot of, *Let's try this, try that.* I went into material sciences, which is one of the hardest disciplines up at Penn State. So then finally being done with my freshman year, I discovered up there was what's called health planning and administration, and that clicked. It was focused on current issues, health and welfare issues; it had a quantitative bent to it. That was kind of where...That became my focus, looking at health policy.

When I finished college, I took the summer off and drove around the country. Came back to Pittsburgh, was looking for jobs, and also learned of this program at a local university called



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Carnegie Mellon. Back then it was the School of Urban and Public Affairs. Again, a very public-policy focus with some professors who were very interested in healthcare policy. I thought, *Well, while I'm looking for a job, I'm going to go interview with them.* They said, *Come on down.* Then I got involved as a research assistant doing statistical analyses with the IBM 360 back then. At that point in time, there was a very influential professor. I was doing a lot of interesting kinds of data analysis for people, but there was a linkage with [Joel Tarr](#), who was starting a program called Applied History and Social Sciences that was joint with Engineering and Public Policy, and the history department, and SUPA, the School of Urban and Public Affairs.

When I finished my master's, I again was looking for a job, and also thought, *OK, let's explore this idea of going for a PhD.* So, I ended up staying on campus and enrolling in the PhD program, what was applied history and social sciences at that time. Then the [Social and Decision Sciences](#) department was established. Throughout all of this, I'm honing my computing skills, but as you can tell from this story, I'm a social scientist at heart. I know statistics, really enjoy that kind of empirical research and data analysis, but I'm not a computer scientist. I just happened to pick up some skills, programming skills, as I was going along. And, so, [I] pursued the PhD, got a position in the central administration, during my PhD work met Jane Siegel, and we already know where that connection ended up.

**Suzanne:** And we're glad that Jane Siegel made that offer to you, because I would not have had a chance to work with you all these years if not.

**Dave:** Yes.

**Suzanne:** I do want to point out to our viewers that you were actually the first person to receive that particular PhD. So, you founded a cadre going forward and made it possible for others to see that possibility. One of the things that I find to be unique about your perspective is that, *I'm not a computer scientist. I'm a social scientist. I'm a statistician, and so I have different ways of looking at the problems the way that a computer scientist might.* I know I'm among many who find that to be very useful and refreshing. I guess the point I want to make there is for the younger people that are out there watching this, you don't have to be a computer scientist to be successful and happy working in the computer software engineering industry. You're a perfect example of coming at this in a very roundabout way, but your contributions have been amazingly valuable over the years. I hope others will take that to heart.

Speaking of observations, you have seen a lot. You and I are of a similar sort of timeframe, and you mentioned IBM 360, and that is not a laptop. That is a mainframe, right? You and I both come from mainframe all the way to cell phones and microdevices and [Internet of Things](#). What are some of the things that you would observe about how the problems in this industry have



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evolved over the years? Give people a sense of what's the difference between what you and I were dealing with in the '70s and '80s versus what we're dealing with now.

**Dave:** I guess in a word, it would be the networks. Everything is connected to everything else. That is certainly a big difference. The programming when I was growing up in all of this was pretty much one thread right through the program.

**Suzanne:** Sure.

**Dave:** There was none of this interrupt-driven kind of polling a device or sensor for something to go on, no parallel programming, none of that was going on. And, you didn't have bandwidth for back-and-forth, client-server, if you will, kinds of interactions that seem seamless today. The languages were quite different. I never did program in Assembly. So, you know, never did that. But Fortran and C, and then one of my favorites was [APL](#).

**Suzanne:** I knew you were going to say that!

**Dave:** And SNOBOL [laughs].

**Suzanne:** APL for those that don't know it, is a very mathematically oriented language. And if you've got the bent that Dave does, yes, that's going to be a real attractive for you.

**Dave:** It was a lot of fun doing things. [Jim McCurley](#) and I had a whole library of APL code we would carry around with us from place to place. You know what else is different? The complexity of everything we're asking software to do now. And you hear this, you know, *The F-35 is a computer with wings*—I mean, we say these things but a lot of the functionality in systems that used to reside in hardware or mechanical devices is now being digitized and handled with software. So that's another big, big change. And just the power, you know? The old laptops I used to laugh about, but what's happening with the early processors, what were they? The 8086 or 80386; 80286? They've turned into [Furbies](#) [*Author's Note: I do not know what chip they use in those toys. The point is that the computing power that was used to send men to the moon became eclipsed by the power that was in toys as advances have occurred.*] Things that used to drive our computers are now toys. Our phones are much more powerful. A lot of the toys and games are way more powerful than things like the IBM 360.

**Suzanne:** A message there also is software's going to be around. It's not going away. If you are looking for a career that is going to persist, there are lots of careers that will persist, but I think software is one of them. The languages are going to change. The focus, the power is going to change, but there is always going to be the need for people to interact with all of that power in a way that gives us useful functionality. And so it's a pretty stable career field in that sense.

**Dave:** To your earlier comment, you have the low-code, no-code movements. This was something that, in a way, I thought about long ago too with even things like spreadsheets. We



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have object orientation. Back then it was more procedural thinking. Can you actually think? And if you can think and decompose a problem into a series of steps, or a series of objects contained and their interactions, you can find ways to take those thoughts and turn them into an application.

**Suzanne:** Yes.

**Dave:** A game, a something, you know?

**Suzanne:** Yes.

**Dave:** There is a lot of support. I think a lot of the individual creativity, it has become more democratized maybe to use that word, or at least more pervasive. The barrier to entry is lower.

**Suzanne:** It is much lower than when we were younger, yes. So what is the most valuable piece of advice or lesson that you would offer to someone who's thinking about going into working in this field, or that is already working in the field? Give us your wisdom.

**Dave:** Let me think. For people in the field, I'd say maybe two points. One is stay curious, and keep looking ahead. Listen to others. Then there is sort of the older fashioned part of me, which says, don't imagine yourself as being infallible. Test your code. Don't assume on the happy path, as they say, and try and break it and see what it does. You'll save everyone a lot of grief if you take that to heart and say, *Well, how could this go wrong?* And challenge your own assumptions. For people who are looking into it, I'd say find a good problem that you're interested in, that you care about, that you might be passionate about. And think about—even if it's just for yourself—if you want to get into doing some computing, what would make that easier? You know? In the past and even today, we see a lot of scripting languages, tying different pieces of functionality together to meet an individual need. If you can envision it for others, Lord knows, you might have the next big app, killer app. But it's finding the right problem. Then find others with similar interests. Talk and find out about it, and then experiment. This does remind me of something from my past because I used to teach administrative staff how to get familiar with the IBM PC. The first thing I'd tell them to do was, OK, just lean on the keyboard. I would say, *Press all the keys down.* And say, *See? You didn't break it. It's OK. You're going to make mistakes; everybody makes mistakes. You are not going to fry the machine. You are not going to damage it.* So nowadays, that probably goes without saying. The thing is, don't worry about making mistakes. Try. Get into it. You'll get better.

**Suzanne:** If you don't make any mistakes, you won't get any better, because you won't learn what works and what doesn't. Well, I want to thank you very much for joining us today. I'm not going to ask you what you're going to do in your retirement, because I already know [laughs] that you're back working, doing some hard problems with us. I wish you the best. I actually look forward to maybe doing a podcast in the future about the results of some of the machine-learning

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research that you are continuing to do. And I really want to thank you for sharing your past, your present, your future, your hobbies with all of our viewers so that they can see. I love being able to show people the people of software engineering. You are one of my favorite people, so thank you for joining us today.

**Dave:** Thank you, Suze.

**Suzanne:** I look forward to talking to you in the future. Any resources we mentioned, we'll have links in the transcript. I also want to thank you for the many years of service that you have given to the SEI and the Carnegie Mellon community, because I for one, and I know many, many others really, really appreciate the work that you have done. You are one of the people that really exhibits our values, and I appreciate that in particular. So thanks, David.

**Dave:** Thank you, Suze. Thanks much. Look forward to talking with you more, working with you more.

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